BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

85-50 GB-1928-08 1928-08

285. 1 SHEET

51

285030

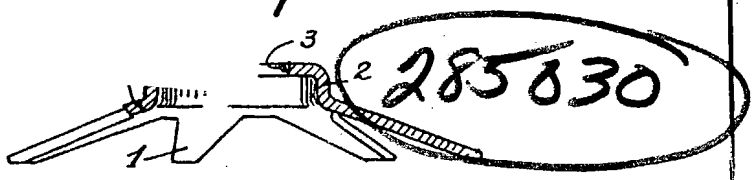


Fig. 2

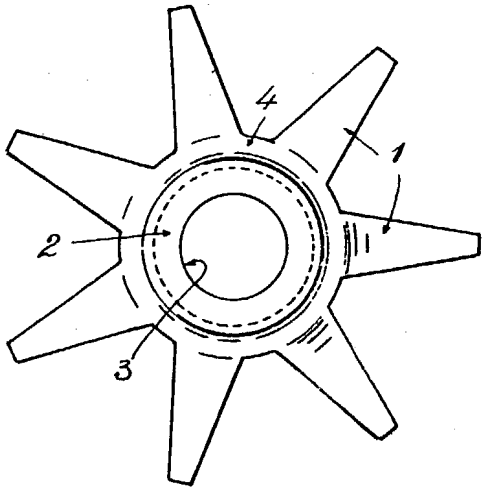


Fig 3

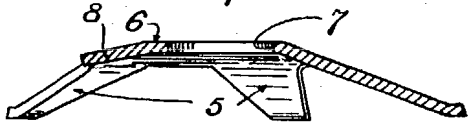
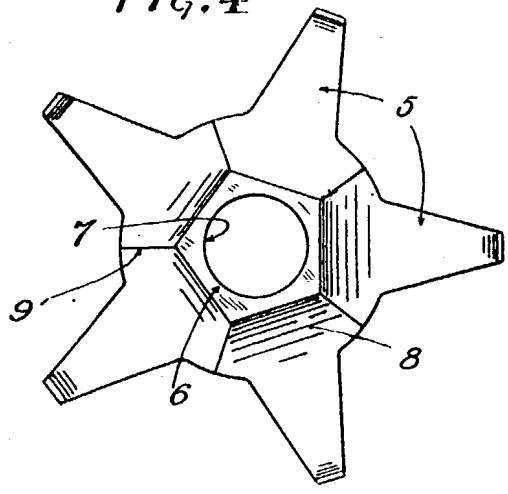


Fig. 4



[This Drawing is a reproduction of the Original on a reduced scale.]

Charles & Read Ltd. Photo Litho.

PATENT SPECIFICATION

Convention Date (France): Feb. 9, 1927. **285,030**

Application Date (in United Kingdom): Jan. 25, 1928. No. 2457/28.

Complete Accepted: Aug. 16, 1928.

COMPLETE SPECIFICATION.

Star Shaped Spring Washer.

We, COMPAGNIE D'APPLICATIONS MECANIQUES, a société anonyme organised under the laws of France, of 42, rue Franklin Ivry-Port (Seine), France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention concerns star shaped spring washers, and more specially those used for adjusting the tension in shock absorbers of the friction type interposed between the suspended and unsuspended parts of automobile vehicles for damping the relative motions occurring between the said parts during the running of the vehicle.

The invention consists in a star shaped spring washer, pressed from a metal sheet of uniform thickness, comprising a central part and radially disposed branches or extensions, in which the central part is so shaped that its moment of inertia relative to a radial axis situated in the plane in which the ends of the branches or extensions lie and passing through the end of one of the branches or extensions is larger than the moment of inertia of a substantially flat surface located at the same average distance from the said plane, accordingly, the mass of the said central part is distributed over a height as large as possible.

The invention also consists in a star shaped washer in accordance with the preceding paragraph in which spaced branches or extensions tapering outwards away from the centre are so constructed that the stress distribution is normal throughout their entire length.

Owing to this arrangement a spring washer is obtained the central part of which is stiff and opposes any substantial distortion in operation whereas all the elasticity is confined to the branches or extensions.

The substantially rigid central part can be cup-shaped and the branches or extensions of the star may connect therewith along a more or less pronounced cone. The entire washer, i.e. both the substantially rigid central part and the elastic branches or extensions connecting thereto, can be directly pressed to the shape of a truncated pyramid; such an arrangement enables the stiffness in the centre and the shape of the resilient or elastic parts to be obtained with a single operation, without any difficulty in machining.

The circle on which the resilient or elastic branches or extensions of the star meet the stiff central part may have any suitable diameter, and the distance between the said branches or extensions, along the said connection circle, has sufficient value to enable the stresses and the fatigue to be supported by the branches or extensions, and not by the central part.

When comparative tests were made with hitherto known washers and washers according to the present invention it has been found in every case that breaks or permanent distortion take place in an entirely different manner. In the hitherto known types, breaks or permanent distortion occur on an approximately radial plane, which renders the washer useless, whereas with the star washers according to the invention, breaks or permanent distortion take place first on one of the branches or extensions along a plane substantially tangent to the connection circle to the central part and at right angles to the radius, enabling the washer to still perform its function partially, on account of the presence of the other branches or extensions.

This arrangement has further the advantage that the elastic distortions are really proportional to the loads, each branch or extension being to be considered as a leaf spring of correct shape supporting a load at one end and securely clamped at the other, thus permitting, when these washers are applied, to accurately adjust the pressures, proportionally to the deflection of the spring washer.

Two forms of construction according to the invention have been illustrated by way of example in the accompanying drawing in which:

Figs. 1 and 2 are respectively a vertical section and a plan view of one form of construction;

Figs. 3 and 4 are respectively a vertical

section and a plan view of another form of construction.

In the example illustrated Figs. 1 and 2, the star washer pressed in a metal sheet of uniform thickness has seven branches or extensions 1 and a central part 2 bored with a hole 3 enabling a bolt or a similar fastening member to pass through. The purpose of the invention is to impart to the central part 2 sufficient stiffness so that no substantial distortion will occur in operation, the elastic work of the washer being then supported by the branches or extensions 1.

In the example shown in Figs. 1 and 2 such a result is obtained by pressing the central part so that it is cup shaped with the concave side turned towards the branches or extensions 1. In this manner, when pressure is applied to the washer, the central part will not be subjected to distortion on account of its large relative moment of inertia, whereas the branches or extensions 1 are resiliently distorted. In case of abnormal pressure and always on account of the large moment of inertia of the central part 2, the latter remains unaffected and the branches or extensions 1, will be subjected to permanent distortion or break according to the value of the applied force. It is obvious that if one of the branches or extensions breaks, the washer is still able to perform its function owing to the presence of the remaining branches or extensions, whereas when the central part 2 breaks along an approximately radial plane, the washer is put completely out of commission. The branches or extensions 1 of the star can be connected to the central part 2 through a more or less tapered cone 4.

In the example illustrated in Figs. 3 and 4, the washer also pressed from a metal sheet of uniform thickness is provided with five branches or extensions 5 and the central part comprises a flat face 6, the area of which is just sufficient to serve as a seat for the assembling bolt or a similar member passing through the hole 7, and a truncated pyramidal shaped surface 8 the angles 9 of which are located in the spaces between two successive branches or extensions 5.

It will be observed that this shape also increases the moment of inertia of the central part relative to an axis situated in the plane in which the ends of the branches or extensions 5 lie. In this manner all the resilient work to be furnished by the washer is supported by the branches or extensions 5 and the central part 6—8 does not undergo any distortion in operation. Further, this arrangement enables the stiffness of the central part and the correct shape of the resilient parts to be obtained at the same time, by a single pressing operation, without any difficulty in machining.

The branches or extensions 1 and 5 are preferably tapered away from the central part so that, for each branch or extension, any cross section at right angles to the axis of the said branch or extension shows an area corresponding to the maximum bending moment that said section has to withstand.

In spite of the stiffness imparted to the central part, a spring is thus obtained having a greater effective resiliency than that of the other star washers of any known type.

The meeting circle of the resilient branches or extensions 1 or 5 with the stiff central part 2 or 8 may have any suitable diameter, and the distance along the said circle, between two successive branches or extensions, is taken sufficiently great so that the stresses and the fatigue are supported by the branches or extensions and not by the central part.

It is to be understood that modifications may be made in the forms of construction described and illustrated without exceeding the limits of the invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A star-shaped spring washer, pressed from a metal sheet of uniform thickness, characterised by the fact that the central part is so shaped that its moment of inertia relative to a radial axis situated in the plane in which the ends of the branches or extensions lie and passing through the end of one of the branches or extensions, is larger than the moment of inertia of a substantially flat surface located at the same average distance from the said plane.

2. A star-shaped washer according to Claim 1, characterised by the fact that the mass of the central part is distributed over a height as large as possible.

3. A star-shaped washer as claimed in Claim 1 or 2, characterised by spaced branches or extensions tapering outwards away from the central part, said branches or extensions being such that the stress distribution is normal throughout their entire length, whereby the resilient distortion is supported by and distributed over the entire length of the said branches.

4. A star-shaped washer according to Claim 3 characterised by the fact that the practically rigid central part is cup-shaped.

5. A star-shaped washer according to

Claim 3 characterised by the fact that the central part and the branches or extensions connecting thereto are shaped in the form of a truncated pyramid.

6. A star-shaped washer according to Claim 1, characterised by the fact that the branches or extensions are sufficiently spaced away from each other, along the connection circle to the stiff part, so that breakage or permanent distortion cannot take place within the central part.

7. A star-shaped spring washer substantially as described with reference to the drawing.

Dated the 23rd day of January, 1928.

CARPMAELS & RANSFORD,
Agents for Applicants,
24, Southampton Buildings, London,
W.C. 2.